

facility vapor connection, must be fitted with a means to prevent backflow of vapor to the vessel's vapor collection system during loading.

(i) Electrical bonding between vessel and shore must be in accordance with 46 CFR 35.35–5.

**§ 154.2102 Facility requirements for vessel liquid overfill protection.**

This section does not apply to facilities collecting vapors emitted from vessel cargo tanks while inerting, padding, or purging the cargo tanks with an inert gas and not loading cargo into the cargo tank.

(a) Each facility that receives cargo vapor from a tank barge that is fitted with overfill protection, in accordance with 46 CFR 39.2009(a)(1)(iii), must provide a 120-volt, 20-amp explosion-proof receptacle for the overfill protection system that meets—

(1) ANSI NEMA WD-6 (incorporated by reference, see 33 CFR 154.106);

(2) NFPA 70 (2011), Articles 406.9 and 501.145 (incorporated by reference, see 33 CFR 154.106); and

(3) 46 CFR 111.105–9.

(b) Each facility that receives cargo vapor from a tank barge that is fitted with an intrinsically safe cargo tank level sensor system complying with 46 CFR 39.2009(a)(2), as a means of overfill protection, must have an overfill control system on the dock capable of powering and receiving an alarm and shutdown signal from the cargo tank level sensor system that—

(1) Closes the remotely operated cargo vapor shutoff valve required by 33 CFR 154.2101(a) and activates the emergency shutdown system required by 33 CFR 154.550 when—

(i) A tank overfill signal is received from the barge; or

(ii) Electrical continuity of the cargo tank level sensor system is interrupted;

(2) Activates an audible and visible alarm that warns barge and facility personnel when a tank overfill signal, or an optional high-level signal corresponding to a liquid level lower than the tank overfill sensor setting, is received from the barge;

(3) Has a mechanism to test the alarms and automatic shutdown systems electrically and mechanically be-

fore operating the vapor control system (VCS);

(4) Has suitable means, such as approved intrinsic safety barriers able to accept passive devices, so that the overfill and optional alarm circuits on the barge side of the overfill control system, including cabling, normally closed switches, and pin and sleeve connectors, are intrinsically safe;

(5) Is labeled at the dock with the maximum allowable inductance (in millihenrys) and capacitance (in microfarads) to be connected to the facility overfill protection system as specified by the equipment manufacturer; and

(6) Has a female connecting plug for the tank barge level sensor system with a five-wire, 16-ampere connector body meeting IEC 60309-1 and IEC 60309-2 (both incorporated by reference, see 33 CFR 154.106), that is—

(i) Configured with pins S2 (N) and R1 (L3) for the tank overfill sensor circuit, pin G connected to the cabling shield, and pins N (L2) and T3 (L1) reserved for an optional high-level alarm connection;

(ii) Labeled “Connector for Barge Overfill Control System”; and

(iii) Connected to the overfill control system by a shielded flexible cable.

**§ 154.2103 Facility requirements for vessel vapor overpressure and vacuum protection.**

In this section, the requirements of having a flame arrester or a flame screen at the opening of a pressure relief valve or a vacuum relief valve apply only to facilities collecting vapors of flammable, combustible, or non-high flash point liquid cargoes.

(a) A facility's vapor control system (VCS) must have the capacity for collecting cargo vapor at a rate of not less than the facility's maximum liquid transfer rate for cargoes that are vapor controlled plus the vapor growth for the cargoes and any inerting, diluting, or enriching gas that may be added to the system. Vapor growth must be considered as 25 percent of the cargo's saturated vapor pressure in pounds per square inch absolute (psia) at 115 °F, divided by 12.5 psia (the vapor pressure of gasoline at 115 °F), times the facility's maximum liquid transfer rate, unless there is experimental data for

actual vapor growth for turbulent transferring under the most severe conditions for vapor growth. If the cargo is transferred at temperatures above 115 °F, the cargo's true vapor pressure (in psia) at the transferring temperature must be used when determining the vapor growth.

(b) A facility VCS must be designed to prevent the pressure in a vessel's cargo tanks from going below 80 percent of the highest setting of any of the vessel's vacuum relief valves or exceeding 80 percent of the lowest setting of any of the vessel's pressure relief valves for a non-inerted tank vessel. A facility VCS also must be designed to prevent the pressure in a vessel's cargo tanks from going below 0.2 pounds per square inch gauge (psig) or exceeding 80 percent of the lowest setting of any of the vessel's pressure relief valves for an inerted tank vessel. The system must sustain the pressure in the vessel's cargo tanks within this range at any cargo transfer rate less than or equal to the maximum transfer rate determined at the pre-transfer conference.

(c) The pressure measured at the facility vapor connection must be corrected for pressure drops across the vessel's vapor collection system, vapor collection hose or arm, and vapor line up to the location of the pressure sensor.

(d) The facility vapor connection must have a pressure-sensing device that meets the installation requirements of paragraph (h) of this section, which activates an alarm that meets 33 CFR 154.2100(e) when the pressure at the facility vapor connection exceeds either—

(1) The pressure corresponding to the upper pressure determined in paragraph (b) of this section; or

(2) A lower pressure agreed upon at the pre-transfer conference.

(e) If a facility draws vapor from a vessel with a vapor-moving device, the facility vapor connection must have a pressure-sensing device, which activates an alarm meeting 33 CFR 154.2100(e) when the pressure at the facility vapor connection falls below either—

(1) The pressure corresponding to the lower pressure determined in paragraph (b) of this section; or

(2) A higher pressure agreed upon at the pre-transfer conference.

(f) The facility vapor connection must have a pressure-sensing device, independent of the device used to activate the alarm required by paragraph (d) of this section, meeting the installation requirements of paragraph (h) of this section, which activates the emergency shutdown system required by 33 CFR 154.550 when the pressure at the facility vapor connection exceeds the lower of the following:

(1) A pressure corresponding to 90 percent of the vessel's lowest pressure relief valve setting, corrected for pressure drops across the vessel's vapor collection system, the vapor collection hose or arm, and any vapor line up to the point where the pressure sensor is located;

(2) A pressure corresponding to 90 percent of the setting of the pressure relief valve at the facility vapor connection, if the facility vapor connection is installed with a pressure relief valve; or

(3) A lower pressure than the pressure in paragraphs (f)(1) and (f)(2) of this section that is agreed upon at the pre-transfer conference.

(g) If a facility draws vapors from a vessel with a vapor-moving device, the facility vapor connection must have a pressure-sensing device, independent of the device used to activate the alarm required by paragraph (e) of this section, which closes the remotely operated cargo vapor shutoff valve required by 33 CFR 154.2101(a) when the vacuum at the facility vapor connection is more than the higher (lesser vacuum) of the following:

(1) A vacuum corresponding to 90 percent of the vessel's highest vacuum relief valve setting;

(2) A vacuum corresponding to 90 percent of the setting of the vacuum relief valve at the facility vapor connection, if the facility vapor connection is installed with a vacuum relief valve; or

(3) A lesser vacuum than the vacuum in paragraphs (g)(1) and (g)(2) of this section that is agreed upon at the pre-transfer conference.

(h) The pressure-sensing devices required by paragraphs (d) and (f) of this section must be located in the vapor

collection line between the facility vapor connection and the following:

(1) Any isolation valve, unless an interlock is provided that prevents operation of the system when the isolation valve is closed; and

(2) Any components that could plug and cause a blockage in the vapor line.

(i) A pressure-indicating device must be provided that displays the pressure in the vapor collection line between the facility vapor connection and any isolation valve or any devices which could cause a blockage in the vapor line.

(j) If a facility draws vapor from the vessel with a vapor-moving device capable of drawing more than 1 pound per square inch (psi) vacuum, a vacuum relief valve must be installed in the vapor collection line between the vapor-moving device and the facility vapor connection, which—

(1) Relieves at a predetermined pressure such that the pressure at the facility vapor connection is maintained at  $-1.0$  psig ( $1.0$  psig vacuum) or less vacuum;

(2) Has a relieving capacity equal to or greater than the capacity of the vapor-moving device;

(3) Has a flame arrester or flame screen fitted at the vacuum relief opening; and

(4) Has been tested for relieving capacity in accordance with paragraph 1.5.1.3 of API 2000 (incorporated by reference, see 33 CFR 154.106) with a flame arrester or flame screen fitted.

(k) When a facility collects cargo vapor through an extensive length of vapor piping, such as an undersea pipeline from a vessel moored offshore, before reaching the first pressure sensor and vacuum relief valve, the vacuum relief valve may be set at a vacuum greater than 1 psi vacuum, provided the pressure controls take into account the pressure drop across the vessel's vapor collection system, any vapor collection hoses, and the vapor piping as a function of the actual transfer rate.

(l) If the pressure in the vapor collection system can exceed 1.5 psig during a malfunction of a pressure regulator or control valve in an inerting, enriching, or diluting system, a pressure relief valve must—

(1) Be located between where the inerting, enriching, or diluting gas is introduced into the vapor collection system and the facility vapor connection;

(2) Relieve at the higher of the following two pressures:

(i) A pressure such that the pressure at the facility vapor connection does not exceed 1.5 psig; or

(ii) The lowest pressure relief valve setting of vessels that control vapors at the facility;

(3) Have a relieving capacity equal to or greater than the maximum capacity of the facility inerting, enriching, or diluting gas source flowing through the failed pressure regulator or control valve, taking into account the pressure drops across any flame arrester or discharge piping fitted at the relief valve's discharge;

(4) Have a flame arrester or flame screen fitted at the discharge opening, if the design does not secure a minimum vapor discharge velocity of 30 meters (98.4 feet) per second; and

(5) Have been tested for relieving capacity in accordance with paragraph 1.5.1.3 of API 2000.

(m) The relieving capacity test required by paragraph (l)(5) of this section must be carried out with a flame screen fitted at the discharge opening if—

(1) The design of the pressure relief valve does not secure a minimum vapor discharge velocity of 30 meters (98.4 feet) per second; and

(2) The discharge is not fitted with a flame arrester.

(n) A facility that collects vapors emitted from vessel cargo tanks while inerting, padding, or purging cargo tanks must—

(1) Provide a pressure-sensing device that activates an alarm meeting 33 CFR 154.2100(e) when the pressure of the inerting, padding, or purging gas exceeds either the pressure corresponding to the higher pressure determined in paragraph (b) of this section or a lower pressure agreed upon at the pre-transfer conference;

(2) Provide a pressure-sensing device, independent of the device required by paragraph (n)(1) of this section, which automatically stops the flow of inerting, padding, or purging gas to the

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vessel when the pressure of the inerting, padding, or purging gas exceeds 90 percent of the lowest setting of any pressure relief valve on the vessel; and

(3) Locate the pressure-sensing devices required by paragraphs (n)(1) and (n)(2) of this section in the inerting, padding, or purging gas piping downstream of any devices in the gas piping that could potentially isolate the vessel from the sensing devices.

### § 154.2104 Pigging system.

(a) If a pigging system is used to clear cargo in the cargo lines to the tank vessel while the vessel is connected to the facility vapor control system (VCS), the pigging system must be designed with the following safety features:

(1) A bypass loop installed in the main liquid cargo line that contains the pig-receiving device, through which all the liquid flow is channeled during pigging operations. The pig must act as a seal to separate the vessel from the compressed inert gas that is used to propel it as the pig travels from the pig launcher to the pig-receiving device;

(2) A mechanism for restricting liquid and gas flow so that the vessel, personnel, and environment are not endangered. The compressed inert gas flow capacity that this mechanism secures must not be more than 95 percent of the combined capacity of all vessel and facility VCS relief valves located upstream of the facility's remotely operated cargo vapor shutoff valve required by 33 CFR 154.2101(a);

(3) A fast-action automatic shutoff valve such as a solenoid valve, which closes on a high-pressure signal from the pressure sensor required by 33 CFR 154.2103(f), located in the liquid bypass loop downstream of the pig-receiving device;

(4) An interlock with the main cargo line manual block valve so that line-clearing operations cannot begin unless the main cargo line manual block valve is closed; and

(5) An automatic means to detect arrival of the pig at the pig-receiving device.

(b) If a cargo line clearance system without using pigging is used to clear cargo in the cargo lines to the tank

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vessel while the vessel is connected to the facility VCS, the cargo line clearance system must be approved by the Commandant.

### § 154.2105 Fire, explosion, and detonation protection.

This section applies only to facilities that control vapors of flammable, combustible, or non-high flash point liquid cargoes.

(a) A vapor control system (VCS) with a single facility vapor connection that receives inerted cargo vapor from a vessel and processes it with a vapor recovery unit must—

(1) Be capable of inerting the vapor collection line in accordance with 33 CFR 154.2107(a) before receiving the vessel's vapor and have at least one oxygen analyzer, which satisfies the requirements of 33 CFR 154.2107(f)(1) and (2), (g), and (h)(2) and (3), sampling the vapor concentration continuously at a point as close as practicable to the facility vapor connection. The total pipe length between the analyzer and the facility vapor connection must not exceed 6 meters (19.7 feet); or

(2) Have a detonation arrester located as close as practicable to the facility vapor connection. The total pipe length between the detonation arrester and the facility vapor connection must not exceed 18 meters (59.1 feet) and the vapor piping between the detonation arrester and the facility vapor connection must be protected from any potential internal or external ignition source.

(b) A VCS with a single facility vapor connection that receives only inerted cargo vapor from a vessel and processes it with a vapor destruction unit must—

(1) Satisfy the requirements of paragraph (a)(1) of this section and have a detonation arrester located as close as practicable to the facility vapor connection. The oxygen analyzer required by paragraph (a)(1) can be located 4 meters (13.1 feet) downstream of the detonation arrester. The total pipe length between the detonation arrester and the facility vapor connection must not exceed 18 meters (59.1 feet) and the vapor piping between the detonation